

Application No.: 10/060,690

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## Amendments to the Claims

This listing of claims will replace all prior versions of claims in the application.

## Listing of Claims

1. (currently amended) A composition comprising:

(a) a fluoropolymer comprising interpolymerized units derived from a nitrogen-containing cure site monomer;

(b) a catalyst composition that includes a compound having the general formula:

$\{R(A)\}^{(-)}\{QR'_k\}^{(+)}\{R(A)_n\}^{(-n)}\{QR'_k\}^{(n)}$  or the precursors thereof added separately or as a mixture;

wherein R is a C<sub>1</sub>-C<sub>20</sub> alkyl or alkenyl, C<sub>3</sub>-C<sub>20</sub> cycloalkyl or cycloalkenyl, or C<sub>6</sub>-C<sub>20</sub> aryl or aralkyl, which may be nonfluorinated, partially fluorinated, or perfluorinated,  $\{R(A)_n\}^{(-n)}$  is an acid anion or an acid derivative anion, n is the number of A groups in the anion, Q is phosphorous, sulfur, nitrogen, arsenic, or antimony, each R' is, independently, hydrogen or a substituted or unsubstituted C<sub>1</sub>-C<sub>20</sub> alkyl, aryl, aralkyl, or alkenyl group, provided that when Q is nitrogen and the only fluoropolymer in the composition consists essentially of a terpolymer of tetrafluoroethylene, a perfluorovinylether, and a perfluorovinylether cure site monomer comprising a nitrile group not every R' is H, and k is one greater than the valence of Q; and

optionally (c) an alcohol of the general formula R<sup>2</sup>-OH, wherein R<sup>2</sup> is an alkyl group having from 1 to 20 carbon atoms, and wherein R<sup>2</sup> ~~can be~~ is optionally fluorinated.

2. (original) A composition according to claim 1 wherein A is selected from the group consisting of: COO, O when R is aryl or alkylaryl, SO<sub>3</sub>, SO<sub>2</sub>, SO<sub>2</sub>NH, PO<sub>3</sub>, CF<sub>3</sub>CF(CF<sub>3</sub>)CH<sub>2</sub>O,

C<sub>n</sub>F<sub>2n+1</sub>CH<sub>2</sub>O wherein n is 0 to 100, CH<sub>2</sub>OPO<sub>3</sub>, (CH<sub>2</sub>O)<sub>2</sub>PO<sub>2</sub>, C<sub>6</sub>H<sub>4</sub>O, OSO<sub>3</sub>, SO<sub>2</sub>NR',

SO<sub>2</sub>NSO<sub>2</sub>R', and SO<sub>2</sub>CRSO<sub>2</sub>R', wherein R' is as defined in claim 1.

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3. (cancelled)

4. (currently amended) A composition according to claim 1 wherein a precursor of  $R(A)_n$   $[[RA]]$  has the general formula selected from the group consisting of  $RCOOM$ ,  $ROSO_3M$ ,  $RSO_3M$ , and  $ROM$ , wherein  $M$  is hydrogen, or an alkali or alkaline earth metal.

5. (currently amended) A composition according to claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from the formula  $R_x-Ph_y-((CH_2)_n-D)_m(R'')_z-Ph_y-((CH_2)_n-D)_m$  wherein each  $[[R_x]]$   $R''$  is the same or different  $C_1-C_{10}$   $C_1-C_{10}$  alkenyl or alkyl,  $x$  is 0 to 5,  $y$  is 0 or 1,  $n$  is 0 to 10,  $m$  is 1 to 5, and  $D$  is selected from  $COO$ ,  $OSO_3$ ,  $SO_3$ , and  $O$  (when  $y$  is 1), provided that the sum of  $x$  and  $m$  is 6 or less and provided that  $x$  and  $y$  are not both zero;  $RCOO$  wherein  $R$  is alkenyl, an alkyl of 1 to 10 carbon atoms, or an aryl of 6 to 20 carbon atoms;  $^{(-)}OOC-(CX_2)_n-COO^{(-)}$   $^{(-)}OOC-(CX_2)_t-COO^{(-)}$  wherein  $[[n]]$   $t$  is 0 to 10,  $X = H, F, \text{ or } Cl$ ; and  $Ph-((CH_2)_p-COO^{(-)})_q$  wherein  $p$  and  $q$  are independently 1 to 4;  $CF_3CF(CF_3)CH_2O$  or  $C_nF_{2n+1}CH_2O$   $C_dF_{2d+1}CH_2O$  wherein  $d$  is 0 to 100; and blends of two or more such compounds.

6. (currently amended) A composition according to claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from the general formula  $^{(-)}O_z-Ph-G_y-Ph-O_z^{(-)}$  wherein  $G$  is a bond or a difunctional aliphatic, cycloaliphatic, or  $C_1-C_{13}$  aromatic radical, or a thio, oxy, carbonyl, sulfinyl, or sulfonyl radical,  $G$  and/or  $Ph$  are optionally substituted with at least one  $Cl$  or  $F$  atom,  $y$  is 0 or 1, each  $z$  is, independently, 1 or 2, and any aromatic ring of the polyoxy compound is optionally substituted with at least one atom of  $Cl, F, \text{ or } Br$  atom, or carboxyl, or an acyl radical, or an alkyl radical; and blends of two or more such compounds.

7. (currently amended) A composition according to claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from the general formula  $^{(-)}O-Ph-C(CX_3)_2-Ph-O^{(-)}$ , wherein  $X$  is  $H, Cl, \text{ or } F$ ; and blends of two or more such compounds.

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8. (currently amended) A composition according to claim 1 wherein a precursor of  $QR'_k$  is selected from the group consisting of tetramethylphosphoniums, tributylallylphosphoniums, tributylbenzylphosphoniums, dibutyldiphenylphosphoniums, tetrabutylphosphonium, tributyl(2-methoxy) propylphosphoniums, triphenylbenzylphosphoniums, and tetraphenylphosphoniums.
9. (currently amended) A composition according to claim 1 wherein a precursor of  $QR'_k$  is selected from the group consisting of phenyltrimethylammoniums, tetrapentylammoniums, tetrapropylammoniums, tetrahexylammoniums, tetraheptylammoniums, tetramethylammoniums, tetrabutylammoniums, tributylbenzyl ammoniums, tributylallylammoniums, tetrabenzylammoniums, tetraphenylammoniums, diphenyl diethylamino ammoniums, triphenylbenzylammoniums, 8-benzyl-1,8-diazabicyclo[5.4.0]undec-7-eniums, benzyltris(dimethylamino) phosphoniums, and bis(benzylidiphenyl phosphine)iminiums.
10. (original) A composition of claim 1 wherein the catalyst composition is prepared in situ.
11. (original) A composition according to claim 1 wherein the catalyst composition is prepared from components dissolved in a solvent.
12. (original) A composition according to claim 1 wherein the fluoropolymer comprises interpolymerized units derived from (i) tetrafluoroethylene, and optionally (ii) one or more perfluorovinyl ethers of the formula:  $CF_2=CFO(R^2_{fO})_a(R^3_{fO})_bR^4_f$  wherein  $R^2_f$  and  $R^3_f$  are the same or are different linear or branched perfluoroalkylene groups of 1-6 carbon atoms; a and b are, independently, 0 or an integer from 1 to 10; and  $R^4_f$  is a perfluoroalkyl group of 1-6 carbon atoms.

13. (original) A composition according to claim 12 wherein the fluoropolymer further comprises interpolymerized units derived from monomers selected from the group consisting of perfluoroolefins, partially-fluorinated olefins, non-fluorinated olefins, vinylidene fluoride, and combinations thereof.
14. (original) A composition according to claim 1 wherein said cure site monomer is selected from a fluorinated olefin and a nitrile-containing monomer.
15. (original) A composition according to claim 1 wherein said cure site monomer is a nitrile-containing monomer having the formula  $\text{CF}_2=\text{CFO}(\text{CF}_2)_L\text{CN}$ ;  $\text{CF}_2=\text{CFO}(\text{CF}_2)_u\text{OCF}(\text{CF}_3)\text{CN}$ ;  $\text{CF}_2=\text{CFO}[\text{CF}_2\text{CF}(\text{CF}_3)\text{O}]_q(\text{CF}_2\text{O})_y\text{CF}(\text{CF}_3)\text{CN}$ ; or  $\text{CF}_2=\text{CF}[\text{OCF}_2\text{CF}(\text{CF}_3)]_r\text{O}(\text{CF}_2)_t\text{CN}$ ; wherein  $L = 2-12$ ;  $q = 0-4$ ;  $r = 1-2$ ;  $y = 0-6$ ;  $t = 1-4$ , and  $u = 2-6$ ; and perfluoro(8-cyano-5-methyl-3,6-dioxa-1-octene).
16. (original) A composition according to claim 1 further comprising a filler selected from fluoropolymer filler, carbon black, and combinations thereof.
17. (original) The composition of claim 1 wherein the fluoropolymer is selected from a fluoroelastomer and a fluoroplastic.
18. (original) The composition of claim 1 wherein the composition has an induction time below about 15 minutes at a temperature of about  $175^\circ\text{C}$ .
19. (original) The composition of claim 1 wherein the composition has a scorch resistance greater than the scorch resistance of a comparative composition tested at the same temperature, which comparative composition has the same fluoropolymer composition of claim 1 but with a urotropin curative.

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20. (withdrawn) The composition of claim 1 further comprising an additional curative material.
21. (withdrawn) The composition of claim 20 wherein the additional curative material is selected from ammonia-generating compounds, substituted triazine derivatives, unsubstituted triazine derivatives, peroxides, bis-aminophenols, bis-amidooximes, and organotin compounds.
22. (original) A shaped article comprising the fluoropolymer composition of claim 1.
23. (withdrawn) The composition of claim 1 further comprising a fluoropolymer containing interpolymerized units derived from monomers selected from the group consisting of perfluoroolefins, partially-fluorinated olefins, non-fluorinated olefins, vinylidene fluoride, perfluorovinyl ethers, and combinations thereof.
24. (withdrawn) The composition according to claim 23 comprising a curative that increases MDR torque in the fluoropolymer composition at 177°C by at least about 0.01 Nm.
25. (withdrawn) The composition of claim 23 further comprising a curative material selected from ammonium salts, ammonia-generating compounds, substituted triazine derivatives, unsubstituted triazine derivatives, peroxides, bis-aminophenols, bis-amidooximes, and organotin compounds; and optionally a coagent.
26. (withdrawn) The composition of claim 25 wherein the coagent is selected from triallyl cyanurate; triallyl isocyanurate; tri(methylallyl) isocyanurate; tris(diallylamine)-s-triazine; triallyl phosphite; N,N-diallyl acrylamide; hexaallyl phosphoramidate; N,N,N',N'-tetraalkyl tetraphthalamide; N,N,N',N'- tetraallyl malonamide; trivinyl isocyanurate; 2,4,6-trivinyl methyltrisiloxane; and tri(5-norbornene-2-methylene)cyanurate.

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27. (withdrawn) The composition of claim 25 wherein the additional fluoropolymer includes interpolymers containing a halogen that is capable of participation in a peroxide cure reaction and wherein the additional curative is a peroxide, and optionally further comprising a triallyl cyanurate coagent.

28. (withdrawn) A shaped article comprising the fluoropolymer composition of claim 23.

29. (currently amended) The composition of claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from the formula  $CF_3(CF_2)_nCOO^{(-)}CF_3(CF_2)_mCOO^{(-)}$  wherein n is 1, 2, or 6, and wherein  $QR'_k$  is selected from tetrabutylphosphonium and tributyl(2-methoxy)propylphosphonium.

30. (currently amended) The composition of claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from the formula  $^{(-)}OOC(CF_2)_nCOO^{(-)}OOC(CF_2)_pCOO^{(-)}$  wherein  $[[n]]$  p is 2 or 4, and wherein  $QR'_k$  is selected from tetrabutylphosphonium and tributyl(2-methoxy)propylphosphonium.

31. (currently amended) The composition of claim 1 wherein  $R(A)_n$   $[[RA]]$  is selected from acetate and benzoate, and wherein  $QR'_k$  is selected from tetrabutylphosphonium and tributyl(2-methoxy)propylphosphonium.

32. (withdrawn) A method of making a fluoropolymer composition comprising the steps of:

a) forming a mixture comprising a fluoropolymer having interpolymers containing units derived from a nitrogen-containing cure site monomer, a catalyst composition comprising a compound having the formula:  $[[\{RA\}^{(-)}\{QR'_k\}^{(+)}]] \{R(A)_n\}^{(-n)}\{QR'_k\}^{(+)}_n$  or the precursors thereof added separately or as a mixture, wherein R is a  $C_1$ - $C_{20}$  alkyl or alkenyl,  $C_3$ - $C_{20}$  cycloalkyl or cycloalkenyl, or  $C_6$ - $C_{20}$  aryl or alkylaryl, A is an acid anion or an acid derivative anion group, which may be heterocyclic, Q is P, S, N, As, or Sb, and each R' is, independently, hydrogen or a substituted or unsubstituted  $C_1$ - $C_{20}$  alkyl, aryl, aralkyl, or alkenyl group, provided that when Q is nitrogen and the only fluoropolymer in the composition consists essentially of a

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terpolymer of TFE, a perfluorovinylether, and a perfluorovinylether cure site monomer comprising a nitrile group not every R' is H, and k is one greater than the valence of Q, and optionally in the presence of an alcohol of the general formula R<sup>2</sup>-OH, wherein R<sup>2</sup> is a C<sub>6</sub>-C<sub>20</sub> alkyl group;

- b) shaping the mixture;
- c) curing the shaped mixture; and optionally
- d) heat aging the cured mixture.

33. (withdrawn) A method according to claim 32 wherein the catalyst is added in a form selected from a compound and a mixture of catalyst precursors.

34. (withdrawn) A method according to claim 32 wherein individual components of the catalyst are separately added to the fluoropolymer composition.

35. (withdrawn) A method according to claim 32 wherein the step of curing further comprises press-curing and optionally post-curing.

36. (cancelled)

37. (withdrawn) A method for increasing the induction period in a curable fluoropolymer composition comprising the steps of:

- a) providing a fluoropolymer comprising interpolymerized units derived from a nitrogen-containing cure site monomer; and
- b) incorporating, into the fluoropolymer, a catalyst composition that includes a compound having the general formula:  $[[\{RA\}^{(-)}\{QR'_k\}^{(+)}]] \{R(A)_n\}^{(-n)}\{QR'_k\}^{(+)}_n$  or the precursors thereof added separately or as a mixture, wherein R is a C<sub>1</sub>-C<sub>20</sub> alkyl or alkenyl, a C<sub>3</sub>-C<sub>20</sub> cycloalkyl or cycloalkenyl or a C<sub>6</sub>-C<sub>20</sub> aryl or alkylaryl; A is an acid anion or an acid derivative anion; Q is P, S, N, As, or Sb; each R' is, independently, hydrogen or a substituted or

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unsubstituted  $C_1$ - $C_{20}$  alkyl, aryl, aralkyl, or alkenyl group, provided that when Q is N and the only fluoropolymer in the composition consists essentially of a terpolymer of TFE, a perfluorovinylether, and a perfluorovinylether cure site monomer comprising a nitrile group not every R' is H; and k is one greater than the valence of Q.

38. (withdrawn) The method of claim 37 further comprising the step of incorporating an alcohol of the general formula  $R^2$ -OH, wherein  $R^2$  is a  $C_1$ - $C_{20}$  alkyl group, and wherein  $R^2$  can be fluorinated.

39. (withdrawn) The method of claim 37 further comprising the step of:

c) shaping the composition.

40. (withdrawn) The method of claim [[37]] 39 further comprising the step of:

d) curing the shaped composition; and optionally

e) heat aging the cured composition.

41. (withdrawn) The method of claim 40 wherein the step of curing includes press-curing, and optionally post-curing.

42. (cancelled)